

# MECHANICAL PROPERTIES AND BIOCOMPATIBILITY IN-VITRO AND IN-VIVO OF PLASMA SPRAYED CARBON NANOTUBE REINFORCED HYDROXYAPATITE COATINGS FOR ORTHOPEDIC IMPLANTS

*Debrupa Lahiri<sup>1</sup>  
Ana Paula Benaduce<sup>1</sup>  
Sybille Facca<sup>2</sup>  
Lidia Kos<sup>1</sup>  
Nadia Jessel<sup>2</sup>  
Arvind Agarwal<sup>1</sup>*

## **Abstract**

Carbon nanotube (CNT) is incorporated in hydroxyapatite (HA) using spray drying technique to synthesize a composite HA-CNT powder which was subsequently plasma sprayed to form composite coating. Addition of 4 wt.% CNT increased the elastic modulus of the composite coating by 76% and fracture toughness by 100%. Effect of CNT reinforcement on tribological behavior been recorded in terms of 95% increase in wear resistance and 40% decrease in coefficient of friction. The improvement in wear properties is a cumulative result of strengthening effect and lubrication offered by CNTs. The biocompatibility of HA-CNT coating is established through viability test which suggests that CNT helps in normal growth and proliferation of osteoblast cells. Gene expression study and BRDU assay provide further insight into the effect of CNT on differentiation, and proliferation kinetics of osteoblast. Preliminary results of in –vivo study of the coatings, implanted in mice femur, indicates normal bone-growth.

<sup>1</sup> *Florida International Univ.*  
<sup>2</sup> *INSERM U977, Faculté de médecine.*